

REMARKS

Claims 1-13 and 19-21 have been examined. Claims 1-5, 10, 11, 15 and 20 have been rejected under 35 U.S.C. § 103(a), and further under the judicially created doctrine of obviousness-type double patenting. Also, as indicated in the Office Action Summary, claims 6-9 and ^{Not} 21 contain allowable subject matter.

I. Preliminary Matters

As a preliminary matter, the Examiner has withdrawn claims 12-14 and 16-19 from consideration, as being drawn to non-elected species. Applicant had indicated that claims 12, 13 and 19 read on the elected species, however, the Examiner maintains that the elected species does not contain features recited in such claims. Applicant acknowledges the withdrawal of claims 12 and 13 without traverse. However, Applicant has amended claim 19 so that it properly depends from a claim elected for prosecution. Therefore, Applicant submits that claim 19 should not be withdrawn.

In addition, Applicant has amended to Abstract to make minor editorial changes.

II. Objection to the Specification

The Examiner has objected to the title of the invention as not being descriptive. Applicant has rewritten the title, but submits that the title should not be construed to limit the scope of the claims. Accordingly, Applicant respectfully requests the Examiner to withdraw the objection.

III. Objection to the claims

The Examiner has objected to claim 21 as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claim. Due to the amendment to claim 19, Applicant submits that claim 21 no longer depends from a multiple dependent claim. Accordingly, Applicant respectfully requests the Examiner to withdraw the objection.

In addition, the Examiner has objected to claims 1, 6 and 11 due to minor informalities. Applicant has amended claims 1, 6 and 11, in accordance with the Examiner's suggestions, and submits that such amendments are not made in response to a prior art rejection, and do not narrow the scope of the claims.

III. Rejection under 35 U.S.C. § 112, second paragraph

The Examiner has rejected claim 10 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In response, Applicant has amended the minor error in claim 10 to clarify that the claimed protective layer is provided in a region facing one end portion of the pressure generating chamber.

Accordingly, Applicant respectfully requests the Examiner to withdraw the rejection.

IV. Rejection under 35 U.S.C. § 103(a) over EP 0 976 560 A2 to Shimada et al.

(“Shimada”) in view of EP 0 903 234 A2 to Furuhata et al. (“Furuhata”).

The Examiner has rejected claims 1-5, 10, 11, 15 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Shimada in view of Furuhata.

A. Claim 1

Applicant submits that the combination of Shimada and Furuhata fail to render claim 1 unpatentable. For example, claim 1 recites an electrode wiring drawn out of an upper electrode provide on one end portion of a pressure generating chamber, and a protection layer provided on the other end portion of the pressure generating chamber for protecting a vibrating plate.

The Examiner acknowledges that Shimada fails to disclose the claimed protection layer, but contends that Furuhata does. However, Applicant submits that the Examiner is misinterpreting and/or misapplying the cited reference.

In Furuhata, the Examiner maintains that insulating layer 90 discloses the claimed protection layer. However, as stated in claim 1, an electrode wiring (lead electrode) is provided on one end portion of the pressure generating chamber, while a protective layer is provided on the other end portion. As shown in Fig. 4B of Furuhata, layer 90 and lead electrode 100 are not provided on opposite ends from each other. Rather, it appears that lead electrode 100 is formed on layer 90. As stated in the reference, contact hole 90a is formed in layer 90 to connect lead electrode 100 to upper electrode film 80 (col. 13, line 58-col. 14, line 4). In addition, layer 90 appears to be formed as a single, insulating layer which covers the entire bottom of upper electrode film 80, the side of piezoelectric film 70, as well as a plurality of pressure generating

chambers 12 (Fig. 2A, 4C; col. 13, lines 53-56). Therefore, such layer fails to be provided only in an “end portion” of a pressure generating chamber for protection of a vibrating plate, as required by claim 1.

Accordingly, since Furuhata fails to cure the deficient teaching of Shimada, Applicant submits that claim 1 is patentable over the cited references.

B. Claims 2-5, 10, 11, 15, 20

Since claims 2-5, 10, 11, 15 and 20 are dependent, either directly or indirectly, on claim 1, Applicant submits that such claims are patentable at least by virtue of their dependency.

V. Double Patenting Rejection

Claims 1-5, 10, 11, 15 and 20 have been rejected under the provisionally created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3, 5-8 and 12 of co-pending Application No. 09/977,380, in view of Furuhata. However, Applicant submits that claim 1 is patentable over the combination of the cited references. For example, the Examiner acknowledges that App. No. 09/977,380 fails to teach or disclose a protection layer, as recited in claim 1, but contends that Furuhata does. However, for the reasons presented above, Furuhata fails to teach or disclose such a feature.

Accordingly, Applicant submits that a terminal disclaimer is not necessary and respectfully requests the Examiner to withdraw the double patenting rejection. In addition, due

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to their dependency on claim 1, Applicant respectfully requests the Examiner to withdraw the double patenting rejection on claims 2-5, 10, 11, 15 and 20.

VI. Allowable subject matter

Applicant thanks the Examiner for indicating that claims 6-9 and 21 contain allowable subject matter.

VII. Newly added claim

Applicant has added claim 22 to provide more varied protection for the present invention.

VIII. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE TITLE:

The title is changed as follows:

[INK-JET RECORDING HEAD AND INK-JET RECORDING APPARATUS]INK-JET
RECORDING HEAD HAVING A VIBRATION PLATE PREVENTED FROM BEING
DAMAGED AND INK-JET RECORDING APPARATUS FOR USING THE SAME

IN THE CLAIMS:

The claims are amended as follows:

1. (Once Amended) An ink-jet recording head, comprising:
a pressure generating chamber that communicates with a nozzle orifice; and
a piezoelectric element having a lower electrode, a piezoelectric layer and an upper
electrode being provided in a region corresponding to the pressure generating chamber via a
vibration plate,

wherein there are provided within a region facing the pressure generating chamber a
piezoelectric active portion as a substantial drive portion of the piezoelectric element and a
piezoelectric non-active portions having the piezoelectric layer continuous from the piezoelectric
active portion but not being substantially driven, the piezoelectric non-active portions being
provided on both end portions of the piezoelectric active portion in a longitudinal direction
thereof,

an electrode wiring drawn out of the upper electrode is provided on one end portion in the longitudinal direction of the pressure generating chamber, and

there is provided a protection layer on the other end portion in the longitudinal direction of the pressure generating chamber for protecting the vibration plate being provided in a region facing an end portion of the pressure generating chamber and in region facing an end portion of the piezoelectric layer within the region facing the pressure generating chamber.

6. (Once Amended) The ink-jet recording head according to claim 1, wherein the protection layer is composed of the same [layer]material as the electrode wiring.

10. (Once Amended) The ink-jet recording head according to claim 1, wherein the protection layer is also provided in a region facing one end portion of the pressure generating chamber.

11. (Once Amended) The ink-jet recording head according to claim 10, wherein the electrode wiring doubles as [the]a protection layer.

19. (Once Amended) The ink-jet recording head according to claim 15[or 16], wherein at least the piezoelectric non-active portion on the side of the other end portion in the longitudinal direction of the pressure generating chamber is formed by removing the lower electrode.

Claim 22 is added as a new claim.

IN THE ABSTRACT OF DISCLOSURE:

The abstract is changed as follows:

Provided is an ink-jet recording head that prevents a vibration plate thereof from damage attributed to drive of a piezoelectric element, and an ink-jet recording apparatus. There are provided within a region facing the pressure generating chamber [12], a piezoelectric active portion [320 as a substantial drive portion of the piezoelectric element 300], and a piezoelectric non-active portions [330 having the piezoelectric layer continuous from the piezoelectric active portion but not being substantially driven], the piezoelectric non-active portions being provided on both end portions of the piezoelectric active portion in a longitudinal direction thereof[.]. An electrode wiring [90] is drawn out of an [the] upper electrode [80 is]which is provided on one end portion in the longitudinal direction of the pressure generating chamber [12]. [And there is]There is also provided a protection layer [100] on the other end portion in the longitudinal direction of the pressure generating chamber [12] for protecting the vibration plate. [being provided in a region facing an end portion of the pressure generating chamber 12 and in region facing an end portion of the piezoelectric layer 70 within the region facing the pressure generating chamber.] Rigidity of the vibration plate is thereby increased.